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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: James W. Robins, et al.	
Application No.: 10/693,045	Group Art Unit: 1742
Filed: October 24, 2003	Examiner: S.R. Kastler
For: METAL MAKING LANCE ASSEMBLY	
Attorney Docket No.: BER184.10014	

I, John F. Letchford, Registration No. 33,328, certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to Mail Stop Appeal Brief - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on August 23, 2005.

John F. Letchford

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

APPELLANTS' BRIEF PURSUANT TO 37 CFR § 41.37

The above-identified application comes before the United States Patent and Trademark Office ("USPTO") Board of Appeals and Interferences ("Board") from a Final Rejection of claims 1-23 dated July 28, 2005.

I. REAL PARTY IN INTEREST

The real party in interest in the present appeal is Berry Metal Company, a Delaware corporation having a principal place of business at 2408 Evans City Road, Harmony, PA 16037, USA.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellants, Berry Metal Company or the undersigned which will directly affect or be directly affected by or have a bearing on the Board's decision in the presently pending appeal.

III. STATUS OF THE CLAIMS

The status of the claims in the application is as follows:

Claims 1-23 remain in the application and are finally rejected.

IV. STATUS OF AMENDMENTS FILED SUBSEQUENT TO THE FINAL REJECTION

No amendments were filed subsequent to the Final Rejection.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

Most broadly, the invention defined in the claims on appeal is addressed to a metal making lance assembly that is also capable of monitoring conditions within a metal making vessel in close proximity to the metal making lance. The claims on appeal include two (2) independent claims, claims 1 and 10.

The metal making lance assembly recited in independent claim 1 on appeal involves (with reference to specification page

and line numbers and drawing reference characters, where available, in parentheses):

a barrel (specification at page 5, lines 16-18; drawing ref. nos. 4, 4a, 4b or 4c);

a tip attached to said barrel (specification at page 5, lines 16-18; drawing ref. nos. 6, 6a, 6b or 6c), said tip including at least one nozzle for discharging at least one of gaseous and particulate metal treatment material into a metal treatment vessel (specification at page 9, lines 21-28; drawing ref. no. 30); and

a sensor feed tube (specification at page 6, lines 12-33, page 10, lines 1-19, page 11, lines 1-3 and page 12, lines 1-6; drawing ref. nos. 10, 10a, 10b or 10c) carried by said barrel and adapted to accommodate passage of at least one disposable sensor (specification at page 7, line 1 through page 8, line 11, and page 10, line 30 through page 12, line 24; drawing ref. nos. 12, 12a, 12b and 12c), said sensor feed tube being separate from and isolated from fluid communication with said at least one nozzle.

Claims 2-9 on appeal further enlarge upon the structure of the metal making lance assembly of claim 1 to define various features which are believed to be representative of preferred aspects thereof.

The metal making lance assembly recited in independent claim 10 on appeal involves (with reference to specification page and line numbers and drawing reference characters, where available, in parentheses):

a barrel (specification at page 5, lines 16-18; drawing ref. nos. 4, 4a, 4b or 4c);

a tip attached to said barrel (specification at page 5, lines 16-18; drawing ref. nos. 6, 6a, 6b or 6c), said tip including at least one nozzle for discharging at least one of gaseous and particulate metal treatment material into a metal treatment vessel (specification at page 9, lines 21-28; drawing ref. no. 30);

at least one disposable sensor for sensing at least one of a characteristic of a molten metal and an operating condition within a metal treatment vessel (specification at page 7, line 1 through page 8, line 11, and page 10, line 30 through page 12, line 24; drawing ref. nos. 12, 12a, 12b and 12c); and

a sensor feed tube (specification at page 6, lines 12-33, page 10, lines 1-19, page 11, lines 1-3 and page 12, lines 1-6; drawing ref. nos. 10, 10a, 10b or 10c) carried by said barrel and adapted to accommodate passage of said at least one disposable sensor, said sensor feed tube being separate from and isolated from fluid communication with said at least one nozzle.

Claims 11-23 on appeal further enlarge upon the structure of the metal making lance assembly of claim 10 to define various features which are believed to be representative of preferred aspects thereof.

It has long been known to use probes, monitors or other sensor means to determine characteristics of metal that is being treated in a metal making vessel as well as the operating conditions of the vessel itself. The sensed data, which may include temperature, gas or other constituent concentration, or some other condition, are gathered and processed at or near real-time, typically by computer, and provide the vessel

operator with important information about the progress or status of the metal making process occurring in the vessel. Metal making systems incorporating such technology often include means for automatically correcting the metal making process, e.g., by adding more or less heat, gas and/or particulate matter to the vessel, if the sensed data do not correspond with expected conditions at a particular phase of the process.

The sensors may be either intended for repeated use or they may be disposable and expended after a single use. If designed for repeated use, they may be used in association with metal making equipment such as refining lances that discharge combustible gases, inert gases and/or particulate matter into the metal making vessel during metal heating and refining processes. Under these circumstances, the sensors are incorporated into the lance structure itself whereby the lance structure serves as protection for the sensor. However, the lance structure must be specially designed and specifically adapted to accommodate the sensor which results in increased lance development and assembly time and cost. And, since the sensor is internal to the lance, if the sensor needs repair or replacement, the lance must be disassembled, thereby resulting in considerable lance downtime and maintenance costs.

A variety expendable or disposable sensors for metal making applications exist on the market. Expendable sensors are typically tethered to suitable hardware, instrumentation and calibration equipment by flexible communications cables. Such sensors, together with their associated hardware, instrumentation and calibration equipment offer a comprehensive control system for the online recording of temperatures and

constituent elements such as carbon, oxygen, hydrogen, nitrogen, and aluminum in hot steel or other metal.

Expendable sensors may be categorized as sublance sensors and drop sensors. Sublance sensors are suspended by an auxiliary lance or sublance that is separate from the metal making lance. A dedicated sensing sublance adds considerable cost to the metal making operation. In addition, the presence of a separate sensing lance adds instrumentality to the metal making vessel that occupies valuable space that might be employed for other useful purposes. Further, a sublance mounted sensor is not an optimal means of reproducibly sensing characteristics in the metal making vessel occurring closely adjacent the metal making lance.

Drop sensors do not require a separate sublance for their placement in a metal making vessel and therefore consume less space in operation. However, they are difficult to position at targeted sites within a metal making vessel and cannot be reliably placed and maintained closely adjacent the metal making lance. Consequently, drop sensors, like sublance sensors, are less than desirable apparatus by which to monitor conditions close to the metal making lance.

An advantage exists, therefore, for an economical system wherein disposable sensors may be used in conjunction with a metal making lance in order to reliably sense conditions in a metal making vessel close to the metal making lance.

The present invention overcomes the deficiencies in the prior art by providing a metal making lance assembly wherein disposable sensors may be used in conjunction with a metal making lance. More particularly, the assembly includes a sensor

feed tube disposed interiorly or exteriorly of a metal making lance that is adapted to accommodate passage of at least one disposable sensor. The sensors may be selected to detect one or more characteristics of a molten metal being treated and/or operating conditions of a metal treatment vessel, especially those in close proximity to the metal making lance. This unique combination of structural features is captured in each of the independent claims on appeal.

VI. GROUNDS OF OBJECTION/REJECTION TO BE REVIEWED ON APPEAL

A statement of each separate ground of objection or rejection Appellant wishes to be reviewed, including the basis of each ground of rejection is as follows:

(1) Claim 1, 2, 4-11 and 13-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fradeneck (U.S. Patent No. 3,813,943) in view of Maatsch (U.S. Patent No. 3,396,960).

(2) Claims 3 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fradeneck in view of Maatsch.

VII. ARGUMENT

(1) Rejection of Claims 1, 2, 4-11 and 13-23 under 35 U.S.C. § 103(a)

Claims 1, 2, 4-11 and 13-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fradeneck in view of Maatsch. Such rejection is respectfully traversed.

For the Board's convenience, independent claims 1 are 10 on appeal are reproduced herebelow, with emphasis added.

1. A metal making lance assembly comprising:

a barrel;

a tip attached to said barrel, said tip including at least one nozzle for discharging at least one of gaseous and particulate metal treatment material into a metal treatment vessel; and

a sensor feed tube carried by said barrel and adapted to accommodate passage of at least one disposable sensor, said sensor feed tube being separate from and isolated from fluid communication with said at least one nozzle.

10. A metal making lance assembly comprising:

a barrel;

a tip attached to said barrel, said tip including at least one nozzle for discharging at least one of gaseous and particulate metal treatment material into a metal treatment vessel;

at least one disposable sensor for sensing at least one of a characteristic of a molten metal and an operating condition within a metal treatment vessel; and

a sensor feed tube carried by said barrel and adapted to accommodate passage of said at least one disposable sensor, said sensor feed tube being separate from and isolated from fluid communication with said at least one nozzle.

Fradeneck discloses a basic oxygen furnace 10 which includes a sensor lance or sublance 16 that is separate and distinct from an oxygen treatment lance 13. The notion of a sensor lance that is separate from a metal making lance is well known in the art. Indeed, a two-lance arrangement and its

inherent disadvantages are discussed at page 3 of Appellants' specification - and it is from such an arrangement that the presently claimed invention represents a significant and patentable departure.

The present invention is directed to a single metal making lance which is capable of performing both metal treatment and sensing functions. In this regard, each of independent claims 1 and 10 clearly state that the sensor feed tube is carried by the lance barrel. That is, the sensor feed tube is carried by a lance barrel having at least one nozzle for discharging at least one of gaseous and particulate metal treatment material into a metal making vessel. In stark contrast, the modest flow of gas which is discharged from the opening 16a of the sensor lance 16 of Fradeneck is employed merely to purge the lance and prevent ingress of slag and metal splash-back into the open end of the sensor lance (see Fradeneck at column 2, lines 59-66). Unlike the present invention, the gas flow from Fradeneck's sensor lance 16 is not used to treat metal in the furnace.

In summary, Fradeneck discloses nothing more than a conventional two-lance arrangement (treatment lance 13 and sensor lance 16) from which Appellants' independent claims 1 and 10 are clearly structurally distinguished.

The Maatsch patent fails to provide a proper link between Fradeneck and the invention recited in Appellants' claims on appeal. Maatsch discloses a combined sensing and treatment lance for use in a metal making vessel. However, the lance includes a consumable probe that is disposed in the center of the nozzle that discharges a stream of oxygen gas from the lance. The probe is cooled by the depressurization of the oxygen as it is

discharged from the lance. In salient distinction, the metal making lance assembly defined in each of independent claims 1 and 10 on appeal requires a sensor feed tube that is separate from and isolated from fluid communication with the at least one treatment material discharge nozzle of the lance. The sensor tube thus shields the claimed consumable sensors from the gaseous and/or particulate metal treatment material discharged by the lance.

The practical significance of this unique construction is that the sensor feed tube greatly reduces sensor reading distortion caused by impingement of the flowing metal treatment material upon the sensor. To illustrate most clearly, the lance assembly shown by Maatsch would be especially ineffective in situations where one would attempt to use a thermal probe or sensor to measure the temperature of the bath or furnace vessel. That is because depressurizing oxygen flowing around a thermal sensor disposed within an oxygen discharge nozzle in the manner of the probe 6 taught by Maatsch would cool the probe, thereby necessarily resulting in distorted temperature readings being taken by the probe.

As demonstrated above, both Fradeneck and Maatsch lack at least one significant feature of the metal making lance assemblies articulated in independent claims 1 and 10 on appeal and their combination, as proposed by the Examiner, does not remedy those deficiencies. Indeed, no combination of the teachings of the Fradeneck and Maatsch patents can produce the invention set forth most broadly in Appellants' independent claims 1 and 10.

Appellants respectfully offer that their particular solution to the particular problem of treating metal in a furnace vessel while accurately and cost-effectively sensing conditions in a metal bath or in the furnace vessel using a single lance assembly is neither disclosed nor suggested, either expressly or impliedly, by Fradeneck, whether considered alone or in any conceivable combination with Maatsch. Indeed, Appellants reiterate that it was because of the shortcomings of existing treatment lance and sensor means which inspired Appellants to conceive and develop the presently disclosed and claimed solution to the problem.

Reversal of the outstanding rejection of claims 1, 2, 4-11 and 13-23 under Section 103(a) as being unpatentable over Fradeneck in view of Maatsch is therefore respectfully requested.

(2) Rejection of Claims 3 and 12 under 35 U.S.C. § 103(a)

Claims 3 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fradeneck in view of Maatsch. Such rejection is respectfully traversed.

In response to this particular rejection, Appellants' arguments above respecting Fradeneck and Maatsch are hereby adopted and reasserted in their entirety by reference thereto.

Dependent claims 3 and 12 require that the sensor feed tube be disposed exteriorly of the lance barrel (recalling that the lance barrel is the barrel of a metal making lance, not a dedicated sensor lance). Neither Fradeneck nor Maatsch disclose

or suggest this feature, either in a metal making lance or a sensor lance. Thus, these claims define inventions which are independently patentable with respect to independent claims 1 and 10 from which they depend. And, as demonstrated at length above, independent claims 1 and 10 are themselves clearly patentable over the Fradeneck-Maatsch reference tandem.

Accordingly, Appellants kindly submit that the outstanding rejection of claims 3 and 12 under 35 U.S.C. 103(a) as being unpatentable over Fradeneck in view of Maatsch is improper and should be reversed.

To conclude, Appellants' claims must be interpreted fairly and accurately. Likewise, the teachings of the prior art cited against the claims on appeal must be fairly and accurately interpreted for what they in fact disclose and/or suggest. The disclosures of the Fradeneck and Maatsch references, when so interpreted, do not disclose or suggest Appellants' claimed invention. Therefore, the invention as a whole would not have been considered obvious to one skilled in this art at the time of Appellants' invention. Accordingly, it is respectfully submitted that the Final Rejection of claims 1-23 should be reversed.

Respectfully submitted,

JAMES W. ROBINS, et al.

Date: August 23, 2005

John F. Letchford
Registration No. 33,328

Archer & Greiner
A Professional Corporation

One Centennial Square
P.O. Box 3000
Haddonfield, NJ 08033-0968
Tel.:(856) 354-3013
Fax: (856) 795-0574
E-mail: jletchford@archerlaw.com

VIII. APPENDIX

The claims on appeal are as follows:

1. A metal making lance assembly comprising:

a barrel;

a tip attached to said barrel, said tip including at least one nozzle for discharging at least one of gaseous and particulate metal treatment material into a metal treatment vessel; and

a sensor feed tube carried by said barrel and adapted to accommodate passage of at least one disposable sensor, said sensor feed tube being separate from and isolated from fluid communication with said at least one nozzle.

2. The assembly of claim 1 further comprising means for loading said at least one disposable sensor into said sensor feed tube.

3. The assembly of claim 1 wherein said sensor feed tube is disposed exteriorly of said barrel.

4. The assembly of claim 1 wherein said sensor feed tube is disposed interiorly of said barrel.

5. The assembly of claim 1 wherein said sensor feed tube is parallel to a central longitudinal axis of the lance assembly.

6. The assembly of claim 5 wherein said sensor feed tube is coaxial with the central longitudinal axis of the lance assembly.

7. The assembly of claim 1 wherein said sensor feed tube is connected to said tip.

8. The assembly of claim 1 further comprising yieldable sensor gripping means for resisting inadvertent discharge of said at least one disposable sensor from the lance assembly during operation.

9. The assembly of claim 1 further comprising means for introducing a flow of pressurized gas into said sensor feed tube.

10. A metal making lance assembly comprising:

a barrel;

a tip attached to said barrel, said tip including at least one nozzle for discharging at least one of gaseous and particulate metal treatment material into a metal treatment vessel;

at least one disposable sensor for sensing at least one of a characteristic of a molten metal and an operating condition within a metal treatment vessel; and

a sensor feed tube carried by said barrel and adapted to accommodate passage of said at least one disposable sensor, said sensor feed tube being separate from and isolated from fluid communication with said at least one nozzle.

11. The assembly of claim 10 further comprising means for loading said at least one disposable sensor into said sensor feed tube.

12. The assembly of claim 10 wherein said sensor feed tube is disposed exteriorly of said barrel.

13. The assembly of claim 10 wherein said sensor feed tube is disposed interiorly of said barrel.

14. The assembly of claim 10 wherein said sensor feed tube is parallel to a central longitudinal axis of the lance assembly.

15. The assembly of claim 14 wherein said sensor feed tube is coaxial with the central longitudinal axis of the lance assembly.

16. The assembly of claim 10 wherein said sensor feed tube is connected to said tip.

17. The assembly of claim 10 further comprising yieldable sensor gripping means for resisting inadvertent discharge of disposable sensors from the lance assembly during operation.

18. The assembly of claim 10 further comprising means for introducing a flow of pressurized gas into said sensor feed tube.

19. The assembly of claim 10 wherein said at least one of a characteristic of metal being treated and an operating condition within a metal treatment vessel comprise a temperature of a metal bath, a concentration of one or more chemical constituents in a metal bath, a concentration of one or more chemical constituents in slag material above a metal bath, a concentration of one or more chemical constituents in a metal making vessel and a temperature of a metal making vessel.

20. The assembly of claim 10 further comprising a data signal receiver and wherein said at least one disposable sensor

comprise a plurality of sensors that are stackable end-to-end whereby they form a continuous electronic circuit that transmits signals corresponding to data being sensed from adjacent said tip to said data signal receiver.

21. The assembly of claim 10 further comprising a data signal receiver and wherein said at least one disposable sensor is tethered by electrical cable means for transmitting signals corresponding to data being sensed from adjacent said tip to said data signal receiver.

22. The assembly of claim 21 wherein said at least one disposable sensor comprise a sensor portion and a connector portion, wherein said connector portion is connectable to an electrical connector that is carried by and is in electrical communication with said electrical cable means.

23. The assembly of claim 10 further comprising a data signal receiver and wherein said at least one disposable sensor communicates wirelessly with said data signal receiver.